of the touch screen. The distribution, size, number, dimension, and shape of the dummy features may be widely varied.

[0091] **FIG. 12** is a simplified diagram of a mutual capacitance circuit **220**, in accordance with one embodiment of the present invention. The mutual capacitance circuit **220** includes a driving line **222** and a sensing line **224** that are spatially separated thereby forming a capacitive coupling node **226**. The driving line **222** is electrically coupled to a voltage source **228**, and the sensing line **224** is electrically coupled to a capacitive sensing circuit **230**. The driving line **222** is configured to carry a current to the capacitive coupling node **226**, and the sensing line **224** is configured to carry a current to the capacitive sensing circuit **230**. When no object is present, the capacitive coupling at the node **226** stays fairly constant. When an object **232** such as a finger is placed proximate the node **226**, the capacitive coupling changes through the node **226** changes. The object **232** effectively shunts some of the field away so that the charge projected across the node **226** is less. The change in capacitive coupling changes the current that is carried by the sensing lines **224**. The capacitive sensing circuit **230** notes the current change and the position of the node **226** where the current change occurred and reports this information in a raw or in some processed form to a host controller. The capacitive sensing circuit does this for each node **226** at about the same time (as viewed by a user) so as to provide multipoint sensing.

[0092] The sensing line **224** may contain a filter **236** for eliminating parasitic capacitance **237**, which may for example be created by the large surface area of the row and column lines relative to the other lines and the system enclosure at ground potential. Generally speaking, the filter rejects stray capacitance effects so that a clean representation of the charge transferred across the node **226** is outputted (and not anything in addition to that). That is, the filter **236** produces an output that is not dependent on the parasitic capacitance, but rather on the capacitance at the node **226**. As a result, a more accurate output is produced.

[0093] **FIG. 13** is a diagram of an inverting amplifier **240**, in accordance with one embodiment of the present invention. The inverting amplifier **240** may generally correspond to the filter **236** shown in **FIG. 12**. As shown, the inverting amplifier includes a non inverting input that is held at a constant voltage (in this case ground), an inverting input that is coupled to the node and an output that is coupled to the capcitive sensing circuit **230**. The output is coupled back to the inverting input through a capacitor. During operation, the input from the node may be disturbed by stray capacitance effects, i.e., parasitic capaciatnce. If so, the inverting amplifier is configured to drive the input back to the same voltage that it had been previously before the stimulus. As such, the value of the paraisitc capciatanec doesn't matter.

[0094] **FIG. 14** is a block diagram of a capacitive sensing circuit **260**, in accordance with one embodiment of the present invention. The capacitive sensing circuit **260** may for example correspond to the capacitive sensing circuits described in the previous figures. The capacitive sensing circuit **260** is configured to receive input data from a plurality of sensing points **262** (electrode, nodes, etc.), to process the data and to output processed data to a host controller.

[0095] The sensing circuit **260** includes a multiplexer **264** (MUX). The multiplexer **264** is a switch configured to perform time multiplexing. As shown, the MUX **264** includes a plurality of independent input channels **266** for receiving signals from each of the sensing points **262** at the same time. The MUX **264** stores all of the incoming signals at the same time, but sequentially releases them one at a time through an output channel **268**.

[0096] The sensing circuit **260** also includes an analog to digital converter **270** (ADC) operatively coupled to the MUX **264** through the output channel **268**. The ADC **270** is configured to digitize the incoming analog signals sequentially one at a time. That is, the ADC **270** converts each of the incoming analog signals into outgoing digital signals. The input to the ADC **270** generally corresponds to a voltage having a theoretically infinite number of values. The voltage varies according to the amount of capacitive coupling at each of the sensing points **262**. The output to the ADC **270**, on the other hand, has a defined number of states. The states generally have predictable exact voltages or currents.

[0097] The sensing circuit **260** also includes a digital signal processor **272** (DSP) operatively coupled to the ADC **270** through another channel **274**. The DSP **272** is a programmable computer processing unit that works to clarify or standardize the digital signals via high speed mathematical processing. The DSP **274** is capable of differentiating between human made signals, which have order, and noise, which is inherently chaotic. In most cases, the DSP performs filtering and conversion algorithms using the raw data. By way of example, the DSP may filter noise events from the raw data, calculate the touch boundaries for each touch that occurs on the touch screen at the same time, and thereafter determine the coordinates for each touch event. The coordinates of the touch events may then be reported to a host controller where they can be compared to previous coordinates of the touch events to determine what action to perform in the host device.

[0098] **FIG. 15** is a flow diagram **280**, in accordance with one embodiment of the present invention. The method generally begins at block **282** where a plurality of sensing points are driven. For example, a voltage is applied to the electrodes in self capacitance touch screens or through driving lines in mutual capacitance touch screens. In the later, each driving line is driven separately. That is, the driving lines are driven one at a time thereby building up charge on all the intersecting sensing lines. Following block **282**, the process flow proceeds to block **284** where the outputs (voltage) from all the sensing points are read. This block may include multiplexing and digitizing the outputs. For example, in mutual capacitance touch screens, all the sensing points on one row are multiplexed and digitized and this is repeated until all the rows have been sampled. Following block **284**, the process flow proceeds to block **286** where an image or other form of data (signal or signals) of the touch screen plane at one moment in time can be produced and thereafter analyzed to determine where the objects are touching the touch screen. By way of example, the boundaries for each unique touch can be calculated, and thereafter the coordinates thereof can be found. Following block **286**, the process flow proceeds to block **288** where the current image or signal is compared to a past image or signal in order to determine a change in pressure, location, direction, speed and acceleration for each object on the plane of